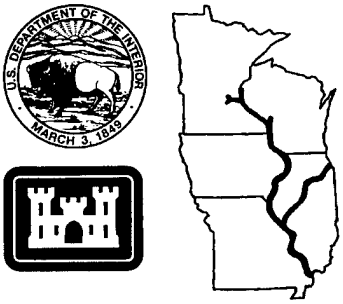

Project Status Report 98-11

Upper Mississippi River
Long Term Resource Monitoring Program
U.S. Geological Survey

Spatial and Temporal Variability of Channel Catfish Populations in the Upper Mississippi River System

by

Todd M. Koel

One application of Long Term Resource Monitoring Program (LTRMP) data is to evaluate long term trends in channel catfish (*Ictalurus punctatus* Rafinesque 1818) populations. This species is an important component of the Upper Mississippi River System (UMRS) fish community because it is numerically abundant, it comprises a significant portion of the total fish biomass, and it is avidly sought by both sport anglers and commercial harvesters.

Since 1989, biologists at the LTRMP Field Stations have monitored fish population and community structure at six pools and in multiple aquatic habitat types of the UMRS. These pools include the tailwater, impounded, side channel, main channel, and backwater habitats defined by navigation lock and dam 4, 8, 13, and 26 of the Mississippi River; the "Open" Mississippi River near Cape Girardeau, Missouri; and La Grange Pool of the Illinois River near Havana, Illinois. Both Pool 26 (at Alton, Illinois) and La Grange Pool Field Stations are operated by the Illinois Natural History Survey (INHS).

Because certain gears are known to be selective for certain sizes and/or species of fish, LTRMP staff use several different gears for community and population assessment, including day and night electrofishing, small and large hoop netting, fyke netting (standard, tandem, and mini), seining, and trawling. The gears that capture the most channel catfish are hoop nets (small and large), accounting for 68.1% of the total catch. Fyke netting, day electrofishing, and trawling account for 8.3%, 8.3%, and 8.2% of the total channel catfish catch, respectively.

A combined total of over 42,000 channel catfish have been captured, measured, and returned to the UMRS by LTRMP fish biologists. There is a striking variability in the catch (and presumably abundance) of channel catfish from one pool to another and usually among habitat types within a pool (Figure 1). The La Grange Pool yielded the largest share of the combined catch (15,912 fish or 38.1%) while Pool 4, along the Minnesota portion of the Upper Mississippi River, yielded the least (1,707 fish or 4.1%). We noticed a strong south to north gradient in day electrofishing catch rates. During nearly all years, the catch rates were significantly higher at Pool 26, Open River Reach, and La Grange Pool than at Pools 4, 8, and 13. Catches by electrofishing ranged from over 10 channel catfish per hour at La Grange Pool in 1997 to less than 1 per hour at Pool 4 in 1994 (Figure 2). In 1993, we

(over)

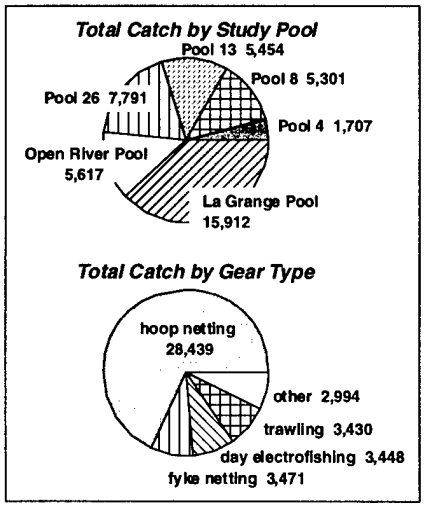

Figure 1. Total catch of channel catfish by each gear type at the Long Term Resource Monitoring Program study pools, UMRS, 1989-1997.

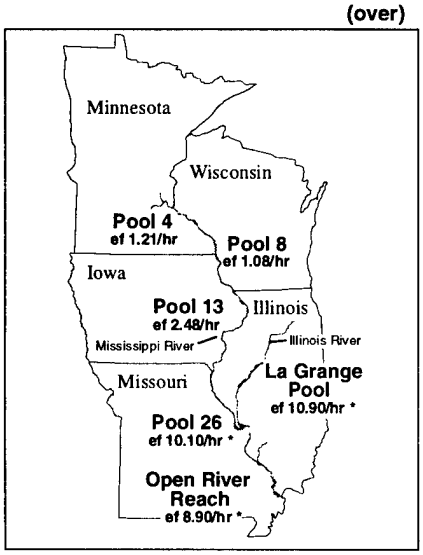

Figure 2. Long Term Resource Monitoring Program study areas of the Upper Mississippi River System with results of 1997 day electrofishing (ef) for channel catfish. Catch rates marked with an asterisk (*) were significantly higher than those without (*P*=0.001).

experienced low catch rates at most of our study pools due in part to high water conditions of the great flood. However, a tremendous number of channel catfish were collected at Pool 26 (over 26 fish were collected per hour by day electrofishing) on the Mississippi River that year.

The total number of channel catfish caught from each habitat type also varied. As one might infer from their name, we caught far more channel catfish in side channel border and main channel border unstructured habitats (33.1% and 36.7% of the total catch, respectively) than in all other habitat types combined. These habitats often provide snags, root cavities and other woody debris with moderate flows required by channel catfish. Only 7.6% and 2.7% of the total catch of channel catfish were taken in backwater and impounded habitats, respectively. Catch rates by hoop nets (Figure 3) were significantly higher in main channel and side channel habitats than in backwater or impounded habitats at Pools 8, 13, 26; Open River Reach; and La Grange Pool ($P<0.10$). However, we found no difference in catches by hoop nets among main channel, side channel, and backwater habitats at Pool 4. Our low catches overall at this pool may explain this lack of distinction. The highest hoop net catches were in main channel border unstructured and side channel border habitats at La Grange Pool of the Illinois River, where catches per 48-hr hoop net sets (one small and one large hoop net) averaged 28 and 35 channel catfish per set, respectively.

Length frequency distributions within study pools were highly variable among years. However, we noticed excellent recruitment of channel catfish in 1991 at nearly all pools of the UMRS. This was likely due to a relatively smooth annual flood pulse in 1991 which provided channel catfish excellent spawning opportunities. The strength of this cohort was evident in subsequent years, particularly at Pool 8, as lengths increased from <10 cm in 1991 to >40 cm in 1997. Although our catches of age-0 fish were high at Pool 26, Open River Reach, and La Grange Pool throughout the 1990s, we caught few age-0 channel catfish during 1992-1997 at Pool 13 and Pool 4. Age-0 channel catfish at Pool 8 were rarely collected during these years. Low catches of small channel catfish in UMRS pools may be partially due to reduced gear efficiency in clear waters with abundant submergent vegetation. Also, trawling was used extensively prior to 1993 (1132 hauls) and was most effective in capturing age-0 channel catfish in 1991; unfortunately, use of trawling was reduced during 1993-1997 which may explain, to some extent, our low catches of small channel catfish at Pools 4, 8, and 13.

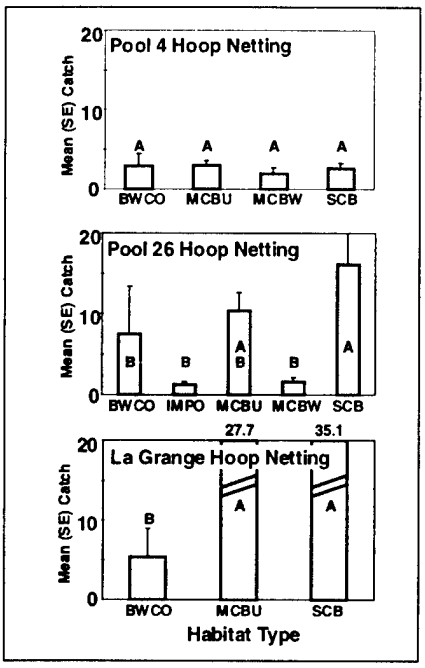

Figure 3. Average hoop netting catch per 48 hour set (UMRS,1993-1997) at Pool 4, Pool 26, and La Grange Pool in backwater contiguous open (BWCO), impounded open (IMPO), main channel border unstructured (MCBU) , main channel border wing dam (MCBW), and side channel border (SCB) aquatic habitat types. Catches with different letters (A, B) within a pool are significantly different from one another (P <0.10).

We documented high spatial and temporal variability in abundance as well as in size distributions of channel catfish. Some of this variability is likely a true reflection of actual fluctuations occurring in these channel catfish populations. However, some of this variability is likely due to differences in the efficiency of our gears among pools and habitat types of the UMRS, as well as among years with variable annual hydrological regimes within each of our study pools. Regardless, there is evidence that years with a high, smooth spring flood pulse that mimics a "natural flow regime" have been beneficial for recruitment of channel catfish. Further research should consider more closely the specific relationships between channel catfish year class strength and hydrological parameters such as flood magnitude, timing, duration, and frequency. □

For further information, contact

Dr. Todd M. Koel
Illinois Natural History Survey
Havana Long Term Resource Monitoring Station
704 North Schrader Avenue
Havana, Illinois 62644
Phone: 309/543-6000
E-mail: todd_koel@usgs.gov
Fax: 309/543-2105

U.S. Geological Survey
Environmental Management Technical Center
575 Lester Avenue
Onalaska, Wisconsin 54650
Phone: 608/783-7550
Fax: 608/783-8058

Project Status Reports (PSRs) are preliminary Long Term Resource Monitoring Program documents whose purpose is to provide information on Program activities. Because PSRs are only subject to internal peer review, they may not be cited. Use of trade names does not imply U.S. Government endorsement of commercial products. All LTRMP Project Status Reports are accessible through the Environmental Management Technical Center's Home Page at http://www.emtc.usgs.gov/

November 1998 **PSR 98-11**